Almost every bureau and branch of the federal government employs mathematicians in some capacity. Mathematicians work in universities and colleges, teaching and doing research. In most four-year colleges and universities, the Ph.D is necessary for full faculty status. Many mathematicians with a master's degree teach at the high school level.

Many other job titles apply to mathematicians who have specialized in an applied branch of mathematics. Actuaries assemble and analyze statistics to calculate probabilities, and thereby set insurance rates. Operations research analysts apply scientific methods and mathematical principles to organizational problems. Statisticians design, carry out, and interpret the numerical results of surveys and experiments. All of these careers begin with an education in mathematics and a curiosity about the use of mathematics to solve problems.

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For more information

There are several professional organizations for mathematicians that have pamphlets and Web pages describing careers in mathematics:

The American Mathematical Society
P. O. Box 5904
Boston, MA 02206-5904
1-800-321-4267 or 401-455-4000
e-mail:ams@ams.org
http://www.ams.org/

The Association for Women in Mathematics
4114 Computer and Space Sciences Building
University of Maryland
College Park, Maryland 20724-2461
Tel: 301-405-7892
http://www.math.neu.edu/awm/

The Mathematical Association of America: http://www.maa.org/

Society for Industrial and Applied Mathematics: http://www.siam.org/

Association for Women in Mathematics is a national professional organization for women and men that aims to improve the status of women in mathematics.

Future mathematicians are encouraged to join the Association for Women in Mathematics
Women's Research Center
Wellesley College
828 Washington Street
Wellesley, MA 02181
This group publishes an interesting and informative bimonthly newsletter.

Be sure to check out the American Mathematical Society's "Professional Information and Services Career Information for High School Students," available from the organization's Web home page.

(original article by Barbara G. Epstein, Applied Mathematician, Los Alamos National Laboratory, Los Alamos, NM)

Medical Technology

What is a medical technologist?

Medical technology is concerned with laboratory tests used in the prevention, diagnosis, and treatment of disease. These tests and analyses are performed by a medical technologist (MT) or a medical laboratory technician (MLT). A medical technologist is knowledgeable in all areas of clinical laboratory work and is able to perform all routine procedures as well as specialized tests requiring more complex techniques. The MT makes independent decisions concerning the quality of laboratory results. Responsibilities often include education of peers, students, and subordinates; research and development of new techniques; and laboratory supervision. The MLT performs most routine laboratory procedures under the supervision of a medical technologist.

What makes a good medical technologist?

The medical technologist (and MLT) must possess the ability to work well with people and the desire to be of service to others. She must demonstrate the highest degree of integrity—honesty, confidentiality, and responsibility—in all areas of her professional and private life. Working under stress while maintaining manual dexterity and logical thinking is essential. Accurate and precise laboratory results require neatness, a high degree of persistence, and a capacity for patient, thorough effort. An interest in and an aptitude for science and mathematics are also helpful.

A research and development (R&D) medical technologist must be creative and have a strong science background. Medical product development can be very challenging and exciting. To become a R&D scientist, one can have a B.S., M.S., or Ph.D. degree in any area of science.

What is life as a medical technologist like?

Few people encounter a medical technologist unless they are hospitalized, and even then they may not realize that the blood specimen taken in the early morning is sent to the laboratory where a technologist or technician analyzes it to help monitor conditions in many parts of the body. By treating the sample in various ways to measure the constituents, a technologist aids the physician in assessing the functions of vital organs and their responses to therapy.

Medical technology is a rapidly advancing and changing field in which automated equipment such as electronic cell counters, computers, and self-regulating chemical analyzers have joined the test tube, the centrifuge, and the microscope as laboratory tools. Technologists must not only master the use of these instruments but also handle their routine maintenance in order to forestall critical work stoppages. They must continually monitor the quality of the performance of these tools, or the results obtained will be incorrect.

Most MTs and MLTs specialize by working in one of several diverse departments such as blood banking, chemistry, hematology, microbiology, or serology. They are among the physician's most valuable assistants in problem-solving, tracking down the causes of disease, checking the effect of antibodies on various microbes, exploring the hormonal status of sterile women, testing for pregnancy, or measuring the clotting capacity of blood. Some technologists become supervisors. They are responsible for orienting new employees, instructing trainees, managing supplies, monitoring work quality, maintaining records, and keeping laboratory procedures up to date.

A research scientist in the field of medical technology creates medical products to help improve health care. She will first research a known problem in a hospital, such as a need for a product that will provide more rapid test results or possibly a new instrument to perform a test or procedure quickly and accurately. Once the problem is identified, a team will develop and test many designs to try to solve the problem. The resulting product will need to work effectively in many types of conditions; it must be easy to use and have a long shelf life. It is likely to take many years to develop a new medical product.

How do I become a medical technologist?

A medical technologist needs a bachelor's degree in a laboratory science or a related area; the curriculum includes structured clinical training in medical technology in a hospital laboratory. Academic programs of universities vary so widely that no typical

course outline can be given. Nevertheless, certification requires that courses prior to clinical training include 16 hours of chemistry (including organic and/or biochemistry), 16 hours of biological science (including microbiology and immunology), and one course in college-level mathematics. Training programs vary in length and structure; most are a year long (50 weeks, 40 hours per week) and replace the fourth year of college or are taken after the B.S. degree is earned. Upon completing training, the graduate is eligible to take state or national certifying examinations given by agencies such as the Board of Registry (American Society of Clinical Pathologists) and the National Certification Agency of Medical Laboratory Personnel.

To undertake such a university curriculum, the student should have taken high school biology, chemistry, and mathematics through trigonometry, with physics as an optional but useful addition.

A medical laboratory technician must complete an associate degree curriculum in laboratory science, including a structured training program in all areas of the clinical laboratory; such a degree program is usually given by community colleges. The graduate takes state or national certifying examinations at the MLT level.

What/where are the jobs?

In their first jobs, most technologists and technicians work in hospital laboratories; nevertheless, positions are available in other health-related or scientific areas. Laboratory professionals may also work in private or industrial laboratories, in public health agencies, in health maintenance organizations, in research or teaching institutions, or in medical programs such as the Peace Corps, VISTA, or Project Hope. Availability of jobs other than in hospitals depends on geographic location, job description, and qualifications. The job outlook is very good and will continue to be good, although opportunities vary among cities and states. Locations with the greatest demand include inner-city facilities and rural areas. Like the job market, salaries vary with location, education, experience, and responsibilities.

Pat Olson
Medical Technologist
Instructor
The University of New Mexico
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Updated by
Judy Hendricks
Medical Technologist

For More Information

An Introduction to the Profession of Medical Technology, M. R. Williams and D. S. Lindberg, 3rd edition, Lea and Febiger, Philadelphia (1979).

Medicine

What is a medical doctor?

A medical doctor is a practitioner of the healing arts. She examines patients, analyzes the results of laboratory tests, diagnoses and treats the patient's medical condition, prescribes drugs, and advises the patient about methods of preventive health care. A medical doctor differs from a pure scientist in that medicine is a marriage of the biological sciences and the humanities. An M.D. must apply her scientific knowledge in the context of patient care.

What makes a good medical doctor?

A doctor is broadly trained in the sciences and the scientific method. A good M.D. must have an interest in and an understanding of how the human body functions. She should have a desire to work with people as well; compassion and honesty are as important as inquisitiveness and scientific aptitude. As in all fields, common sense, too, is helpful. The good doctor listens well and is aware of the patient's feeling about the medical problem, not just the problem itself. She must be able to recognize what are the most important questions to ask a patient and what are the best tests to perform to arrive at a diagnosis.

What is life as a medical doctor like?

Life as a medical doctor can vary depending on your field of practice. A general practitioner, internist, pediatrician, or obstetrician-gynecologist provides primary care of patients. Specialists such as ophthalmologists (eye physicians and surgeons), otorhinolaryngologists (ear, nose, and throat doctors), orthopedists (bone doctors), endocrinologists (hormone specialists), and dermatologists (skin doctors) diagnose and treat problems specifically related to their areas of specialization.

Depending on the specialty, you may have regular office hours or you may receive emergency phone calls in the middle of the night. As a doctor, you can have an individual practice or a group practice, or you can do all your medical work at a hospital. Some M.D.s are totally involved in patient care, others in teaching at a medical school. Many combine the two and spend part of their time teaching medical students, interns, and residents.

Another important function of an M.D. is to serve on various panels with colleagues and other members of the medical profession and on committees such as the medical malpractice panel of the state medical society or on hospital committees, such as patient care or cost containment. A large part of your time must be spent in continuing education to maintain your license as an MD as well as certification in your area of specialization. The field of medicine changes so rapidly that you must keep up with the current state of the art in order to provide up-to-date care for your patients.

The advantages of a career in medicine can include the satisfaction in the development of a trusting and lasting relationship with a patient. A doctor is often involved in life-and-death type responsibilities; coping with the severe illness or death of a young child can be very wearing.

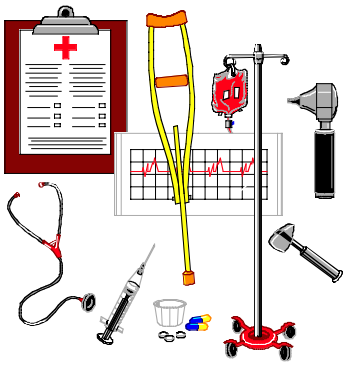
How do I become a medical doctor?

To become a medical doctor, you need a college education and graduation from a school of medicine. Medical school generally takes an additional four years beyond college. Specialization takes further training. In ophthalmology, for example, residency takes three additional years of training and, until recently, a year of internship prior to the residency. Other specialties, such as surgery, can require six years or more.

All doctors must be licensed by their respective state boards of medical examiners. Nevertheless, in most states renewal of licenses is a mere formality. New Mexico and several other states, however, make renewal of the license to practice medicine contingent upon completion of a prescribed amount of accredited postgraduate study in medicine.

You must take many science courses, particularly in the biological sciences, in both high school and college. Nevertheless, there are qualities besides scientific knowledge that make a good doctor. You can run the risk of becoming so intent on making good grades in the sciences that other areas are neglected. Be realistic and understand that competition for entry into medical school is

stiff. A broad education in high school is advisable before you must begin to concentrate on the required courses in college. High school courses should include English, mathematics, biology, and chemistry. Since requirements differ from school to school, determine the various college courses necessary for admission to different medical schools.



Where/what are the jobs?

More doctors are needed in the area of family practice or general practice, i.e., the area of "primary care." Openings in the specialties, in general, are less common. Small towns are more in need of doctors than large cities; the South and Midwest are more in need than the east and west coasts. Salaries are extremely variable depending on location, type of practice, and type of specialty.

Betty A. Hagman
Ophthalmologist (1984)
Albuquerque, NM

For more information

A list of approved medical schools and general information on premedical education, financial aid, and medicine as a career are available from the following:

Council on Medical Education
American Medical Association
535 N. Dearborn Street
Chicago, IL 60610

Association of American Medical Colleges
Suite 200, One Dupont Circle NW
Washington, DC 20036

For careers in anatomy:
http://www.anatomy.org/anatomy/

Oceanography

What is an oceanographer?

An oceanographer can be a biologist, chemist, physicist, geologist, engineer, mathematician, computer scientist, meteorologist, or you! As a relatively new frontier, oceanography is a wonderfully challenging and exciting field of study providing many career opportunities. It's an important field of study because oceans encompass 70% of the earth's surface, and they also have an important role in understanding global weather patterns.

Chemical, geological, and physical oceanographers investigate the physical aspects of the ocean, such as salinity, currents, and the ocean floor. Biological oceanographers study marine plants and animals and their processes within the context of their ocean environments. Ocean engineers provide the technology and instrumentation that allows oceanographers to explore questions and solve problems in a variety of ways.

Life as a oceanographer is not routine. Oceanography camp participant sampling the coastal environment near shore. This teen oceanographer is using a sieve net to identify the fish inhabiting the area.

Oceanographers are global scientists who study a wide variety of topics. There is never a shortage of questions to answer or things to discover! For instance, as a chemical oceanographer you might study how sea water and sediments form, how pollutants and waste disposal impact the ocean, or how the ocean effects climate. As a physical oceanographer you study the ocean from a "big picture" perspective, often using satellites (remote sensing) to understand how and where water moves, and how the ocean interacts with the land and atmosphere to influence weather patterns. As a marine geologist or geophysicist, you may study the formation of beaches, map the earth's interior, or drill into the ocean's floor to discover the ocean's history of sea-level rise and earthquakes. Understanding these questions helps to develop sound management policies for harvesting seafood, responding to pollution, and recovering resources for biotechnology. The newest area of biological oceanography is marine molecular biology. Marine biology is the best known area of biological oceanography, and because of it's popularity, it is currently the most competitive field of oceanography to find a job in. Oceanographic research branches into other disciplines as well. These fields include, but are not limited to, marine resource management, computer modeling of marine ecosystems, aquaculture, limnology (the study of inland water systems), and mining for natural resources including nickel, copper, manganese, petroleum, and natural gas.

Teen oceanographers "out at sea" during Oceanography camp collecting a sediment sample during a research cruise near Tampa Bay, Florida. This information helps to understand the types of sediments that compromise the ocean floor near estuaries.

Because the oceans are linked to our survival on planet Earth (comfortable climate and oxygen to breathe), oceanographers work side by side with policy makers, social scientists, educators, and businesses to develop effective ways of managing and maintaining our ocean resources. Our dependence on the global ocean will increase as we look to the ocean to sustain our expanding population's needs such as food and water. Through continued research and new technology, we are learning how the oceans affect life and the future of our planet.

What makes a good oceanographer?

Just as the ocean environment is incredibly diverse, so too are the many people who study the global ocean. Oceanographers share an excitement, curiosity, and sense of adventure in exploring planet Earth's largest environment. She needs patience to collect data and conduct experiments. It is really beneficial to develop good communication skills and to work effectively as a team member. Most major questions about the global ocean are answered through the collabo-

It's fun to do science. Oceanography camp participants collecting a water sample from several meters below the ocean's surface. Water samples will be analyzed for nutrient levels and chlorophyll concentrations.

ration of many people with various specialties. In preparing to be an oceanographer, you should be flexible and explore all your options in this ever-growing field. Oceanographers are generally very creative and innovative people who embrace challenging problems and address complex issues impacting our society today and in the future.

What is life as an oceanographer like?

Your life as an oceanographer is really variable, and you could work in a lot of different settings. For example, you may be in a small boat along the coastline for a day, in a laboratory setting over several days, or on a research vessel near Antarctica for several months. You may be on the water, in the water, under the water, or studying the areas along the shoreline. In the laboratory oceanographers process data, perform library research, prepare graphs and tables, and write about their results. Oceanographers also present their research at scientific meetings and in scientific journals.

Beginning oceanographers with a B.S. degree work as research or laboratory assistants, performing routine data collection, computation, and analysis. Most beginning oceanographers receive on-the-job training as needed. Experienced oceanographers direct surveys and research programs or advance to administrative or supervisory positions in research labs.

Life as an oceanographer is not very routine and is definitely not a nine-to five-job. In fact, you may spend long hours on a project or be on a research cruise for months at a time. You must be flexible. Be encouraged to know that all the hard work and long hours are extremely rewarding! Being an oceanographer is a great career. It is truly exhilarating to discover things first-hand and explore questions whose answers will benefit our planet as a whole. As an oceanographer you may be an educator who has the privilege of passing along to others the experiences of your career and research.

How do I become an oceanographer?

The minimum requirement for an oceanographer is a B.S. degree in oceanography, biology, earth or physical sciences, mathematics, or engineering. Most jobs require graduate training in oceanography.

Prepare early! Take as many math, science, and computer classes in school as you can. Currently, the more math classes you take the better your job opportunities will be because you will be best prepared for a variety of jobs. Even if you do not understand why you're taking some classes or how they relate to your interests, take them anyway and do well. Generally, more math means a higher salary. Your goal in high school should be to have at least four math credits (including trigonometry, algebra, and calculus) and four science credits (including geology, chemistry, biology, and physics). Your college courses should include biology, meteorology, geophysics, and some specialized science classes that apply to the study of oceans. Graduate courses should include advanced oceanography as well as areas of special interest for you. While all these classes might sound intimidating, they are taken in a sequence that allows you to build on what you have already learned.

Be a volunteer and "shadow" in as many places as you can (industries, governmental agencies, aquariums, museums, colleges, libraries). Look for opportunities to gain hands-on experience. There are a lot of summer programs available in the sciences. To identify programs contact the National Marine Educators Association 408-648-4837. Be prepared for a challenge, and keep your goal in sight even when the way seems difficult. Persevere in following your dream. Be committed to hard work and dedication. Don't give up; you will succeed, and you will be greatly rewarded!

Campers at the Oceanography camp for girls spent the day restoring our local environment by planting marsh grass along the shoreline of Tampa Bay, Florida. This camper is holding a cup of fertilizer, which is used to give the salt marsh plants a head start in their new lives.

What/where are the jobs?

Oceanographers are employed by industry, the federal government, and in academia. As with any field, the career opportunities available will depend on market demand and competition. Currently, the greatest demand in oceanography is for chemical and physical oceanographers and ocean engineers. The future looks bright in the fields of remote sensing, mathematical modeling, computer programming, aquaculture, biotechnology, engineering, and public policy. Salaries depend largely on your training and area of specialization. Be realistic! Stay current on the job market through your college and advertisements in science periodicals, join professional organizations, and access electronic bulletins. If you are committed to exploring a career in oceanography, you should pursue it aggressively and know that the ocean sciences are available to all!

Lori Cary-Kothera
Oceanographer
811 Issaqueena Trail #410
Central, SC
864-653-9327

Teresa Greely, Oceanographer
University of South Florida Department of Marine Science
1407th Avenue South
Saint Petersburg, FL 33701
813-553-3921
E-mail: greely@marine.usf.edu

For more information

Careers in Oceanography and Marine-Related Fields
The Oceanography Society
4052 Timber Ridge Drive
Virginia Beach, VA 23455
804-464-0131.

Marine Science Careers -
A Sea Grant Guide to Ocean Opportunities.
Sea Grant Communications Office
Kingman Farm,
University of New Hampshire,
Durham, NH 03824-3512
603-749-1565

The Women in Engineering Program Advocates Network
1284 CIVL Building, G-296
Purdue University
West Layfayette, IN 47907-1284

The Environmental Careers Organization;
206-625-1750. Internships

National Sea Grant College Program
National Oceanic and Atmospheric Administration
SSMC3 Room 11606, 1315 East-West Highway
Silver Spring, MD 20910
301-713-2431

Team work! Hard work. Not routine, be flexible! Oceanography camp* participants use a trawl net to discover who lives in the bay. The net contained lots of different fish and invertebrates which were identified, counted, measured, and promptly returned to their ocean home.

***The Oceanography camp for girls is sponsored by the Department of Marine Science in St. Petersburg Florida and by the National Science Foundation. They supplied all pictures in this chapter. The girls shown in the pictures are from the Tampa Bay region.**

National Marine Educators Association
PO Box 51215
Pacific Grove, CA 93950
408-648-4837

Association for Women in Science
1522 K Street, Suite 820
Washington, DC 20005
202-408-0742

American Society of Limnology and Oceanography
Virginia Institute of Marine Science
PO Box 1346
Gloucester Point, VA 23062
804-642-7000

Association for Women Geoscientists
4779 126th Street North
White Bear Lake, MN 55110-5910

The National Science Foundation
Office of Legislative and Public Affairs, Room 1245
Wilson Boulevard, Arlington, VA 22230
703-306-1070
see http://www.marine.usf.edu/girlscamp

Patent Agent

What is a patent agent?

A patent agent helps inventors or owners of inventions get patents on their inventions. In order to understand the technical nature of the invention, patent agents talk with scientists or engineers who have made the invention and entrepreneurs or business people who have acquired rights in the invention. The patent agent must then gain an understanding of where the invention fits in the technology it represents and in what ways it is unique and thus eligible for a patent. Next the patent agent presents the invention to the U.S. Patent and Trademark Office in the form of a patent application with claims to the invention. The patent agent has been trained in the rules for working with the U.S. Patent and Trademark Office to get the patent issued.

What makes a good patent agent?

A good patent agent has curiosity about the way things work and the ability to understand technical concepts, processes, and apparatuses. The patent agent must be an excellent communicator, both verbally and in writing. The patent agent has to be able to explain the rules for patentability and procedures for obtaining a patent to the inventor or owner of the invention. The patent agent has to be able to write a description of the invention that will enable others to use the invention, and write claims to the invention that communicate clearly what it is that the public is excluded from making, using, or selling without permission from the holder of the patent.

Patent agents need excellent negotiating skills to get patent examiners at the U.S. Patent and Trademark Office to agree with the patent agent, the inventor, and, if the rights to the invention have been assigned, the owner of the invention, as to the nature of the invention and how much of the particular technical area can be claimed as the invention.

Patent agents have to be detail-oriented and well organized so that they meet all deadlines imposed by the rules and U.S. Patent Office during the process for obtaining a patent, which often includes timely submission of a number of forms, requests for amendments to the patent application, declarations by persons skilled in the technical area, petitions for various procedures, and drawings of the inventions that meet very exact standards published by the U.S. Patent and Trademark Office.

What is life as a patent agent like?

Patent agents most often work for a law firm or a corporation or enterprise that has research and development activities resulting in inventions or that purchases rights to inventions. A small number of patent agents have been hired by national laboratories where research is taking place. Other patent agents are self-employed and seek inventors or businesses or investors who desire patents. These agents may go to meetings of inventors' clubs and entrepreneural organizations, give talks on how to get patents on an invention, and get referrals from attorneys and business people who deal with inventors and small businesses. Most of a patent agent's professional life is spent reading, writing, and talking with inventors, owners of inventions, and patent examiners employed by the U.S. Patent and Trademark Office.

How do I become a patent agent?

To become a patent agent you must have a science or engineering background, and you must be admitted to practice before the U.S. Patent and Trademark Office, a United States government agency. Admission to practice before the U.S. Patent and Trademark Office requires a college degree in science or engineering or equivalent experience and a passing score on an examination of your knowledge of the rules of practice before the U.S. Patent and Trademark Office.

The most worthwhile high school courses are those that teach scientific or engineering concepts and those that help you develop communication and negotiation skills. Courses that develop your intellectual, scientific, and technical curiosity and the ability to organize ideas and pay attention to detail are important. College subjects needed are those that will result in one of the scientific or technical degrees listed by the U.S. Patent and Trademark Office as meeting the requirement for registration for practice before the U.S. Patent and Trademark Office as well as courses that build on the high school courses referred to above.

What/where are the jobs?

Jobs for patent agents, especially self-employed patent agents, can be anywhere in the United States. Many patent agent jobs are in cities like Washington, D.C., where the U.S. Patent and Trademark Office is located, and cities such as New York, Chicago, Los Angeles, and San Francisco, where many large corporate headquarters are located. A good number of patent agent jobs are in patent departments of the largest corporations with research and development departments in the towns and cities where the research and development facilities are located.

Morrison Bennett
Los Alamos National Laboratory
Legal Counsel Business & Patent Law
MS D412
Phone: 505-667-6989
Fax: 505-665-3100
E-mail: mbennett@lanl.gov

For more information

Applications for taking the U.S. Patent and Trademark registration examination are available from
U.S. Patent and Trademark Office
Office of Enrollment and Discipline
Washington, D. C. 20231
Telephone: 703-308-5316

Courses that specifically prepare people for taking the examination for registration of patent agents are offered by several companies, including the following:

Patent Resources Group, Inc.
528 East Main Street
Charlottesville, VA 22902
1-804-296-3900

Patent Law Institute
810 Seventh Avenue
New York, NY 10019
1-800-260-4754

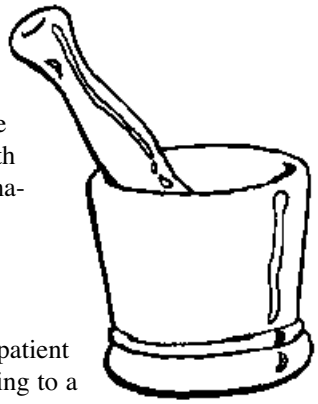
Pharmacy

What is a pharmacist?

A pharmacist works with drugs in their preparation and use to cure, control, and prevent illness. The majority of pharmacists work in retail pharmacies with the remainder working in such areas as hospitals, nursing homes, manufacturing, biopharmaceutics, or research. In the health care system retail pharmacists dominate in the dispensing of drugs prescribed by physicians. A pharmacist must work hand-in-hand with the doctors to make sure that each patient receives the correct medication for his/her condition. Pharmacists help patients understand how their medications will control or cure their illnesses as well as how to properly take and store the medications.

A research pharmacist works with chemicals that possess desirable drug effects and the challenge of putting these chemicals into a finished products such as tablets, injections, suspensions, suppositories, or patches. The final drugs must meet the Federal Drug Administration requirements related to stability, safety, and effectiveness.

A pharmacist may choose a hospital or clinic setting where she deals directly with doctors and nurses by showing them how to prepare and administer drugs safely. She is also included on patient-care teams that evaluate the patients' conditions and recommend drugs for their treatment.



What makes a good pharmacist?

A good pharmacist is interested in the study of drugs and their effects on the human body. She must love chemistry, biology, and mathematics. A pharmacist must have the desire to work with people and be able to communicate effectively with physicians. Most importantly, a good pharmacist must have the desire and the patience to work with the elderly and with very ill patients.

What is life as a pharmacist like?

Working as a pharmacist is a very exciting experience. Knowing that you play a role in helping a patient prevent or treat illness is very rewarding. A retail pharmacist is well-respected, and is, according to a recent Gallup Poll, "...the most trusted professional in America." That's quite a challenge to live up to! Patients tell you intimate details of their lives and illnesses, and you must respect their privacy and truly care about them. Pharmacists help patients understand how their medications will control or cure their illnesses as well as how to take and store medications properly.

How do I become a pharmacist?

If you are interested in pharmacy, you should take as many chemistry, math, and science classes as possible in high school, including physics, biology, algebra, trigonometry, and calculus. A pre-pharmacy program of two years of select college classes is required before you can apply for admission to the College of Pharmacy at the University of New Mexico. Classes in the College of Pharmacy are limited to forty to forty-five students per year, and you will be competing with several hundred students for admission, so good grades are a must. Once you are accepted into the College of Pharmacy, you must complete four years of pharmacy classes. After graduating with a Pharm-D degree, you have to pass a national board examination and a state laws exam. You must then apply for registration in the state where you want to practice. Each state requires a law exam, but the pharmacy portion of the exam will transfer among most states.

Where/what are the jobs?

Pharmacists work in retail stores, drug manufacturing, research hospitals, nursing homes, and education. A retail pharmacist may choose to work for a national chain or own her own store. Hospital pharmacists may choose a small clinic hospital or a large, complex health care facility to work in. The armed forces offer pharmacists an officer's commission.

New Mexico has a lot of great opportunities for employment in the rural areas. A pharmacist can work full time or part time or simply do relief work when she wants to. Some pharmacists in the larger cities have full-time jobs and pick up extra hours at a chain store that is open twenty-four hours a day. There is a large variety of jobs available in pharmacy—something for everyone.

Barbara Wood
The Medicine Shoppe
Silver City, New Mexico

For more information

New Mexico Pharmaceutical Association
4800 Zuni, S.E.
Albuquerque, NM 878108-2898

Virtual Library Pharmacy:
http://www.cpb.uokhsc.edu/pharmacy/pharmint.html

For pharmacology and experimental therapeutics:
http://www.faseb.org/aspet/

Physician Assistant

What is a physician assistant (PA)?

A PA is a health professional licensed by the state or certified by a federal employer to practice medicine with the supervision of a physician (doctor). PAs practice as part of a team with their supervising physicians. They perform a wide range of medical duties including diagnosing and treating illness and injuries, providing medical emergency care, assisting in major surgery, and providing pre- and post-operative care. PAs are trained to provide approximately 80 percent of the services usually designated to a doctor in a primary care or general medical service setting. Responsibilities of a PA depend on the PA's training, experience, state law, and what the supervising physician delegates to the PA. Currently forty states, the District of Columbia, and Guam authorize PAs to write and sign prescriptions without the physician's cosignature.

What makes a good physician assistant?

PA programs look for students who want to study, work hard, and be of service to other people. A good PA must have an interest in and an understanding of how the human body functions. She should have a desire to work with people as well; compassion and honesty are as important as inquisitiveness and scientific aptitude. As in all fields, common sense, too, is helpful. The good PA listens well and is aware of the patient's feeling about the medical problem, not just the problem itself. She must be able to recognize what are the most important questions to ask a patient so that she and the physician can determine the diagnosis and plan the best treatment.

What is life as a physician assistant like?

Physician assistants perform physical examinations, diagnose illnesses, formulate and carry out treatment plans, order and know how to analyze laboratory tests and other diagnostic studies, assist in surgical procedures and sew up wounds, apply casts on broken bones, and provide information to the patient on care of his/her illness or injury and on prevention of disease.

PAs and their supervising physicians often work in the same location, so that there can be immediate consultation between the physician assistant, doctor, and patient in unusual or complicated cases. But most states do not require that PAs and their supervising physicians are at the same location; states require the supervising physician to be immediately available for consultation either in person or by telephone, radio, or other method. This allows PAs to treat patients in remote areas that might otherwise not have immediate access to medical care (e.g., rural towns, Alaska, Native American reservations, migrant farm workers' locations, ships, etc.)

How do I become a physician assistant?

Most programs require you to have some previous health care experience (e.g., nurse's aide, home health care aide, or military medical experience) and some college courses. Most people who apply to a PA program have a college degree. College courses typically required before you apply to a PA program include English, math, biology, microbiology, chemistry, medical terminology, and psychology. There are currently 104 PA programs in the U.S. located at colleges, universities, medical schools, or teaching hospitals, and through the Armed Forces.

A typical PA program is two years in length. The first year includes classroom lectures and lab sessions in anatomy, physiology (how the body works), microbiology, pharmacology (how medicines work), medical decision-making and patient education. The second year is spent in clinical rotations with other health care professionals such as medical students, interns, and residents in areas of family and internal medicine, surgery, pediatrics, obstetrics and gynecology, mental health, and other specialties. Depending on the specific PA program, the credentials awarded include a Certificate of Completion, associate's degree, bachelor's degree, master's degree, or Graduate Certificate of Completion. After graduation from an accredited PA program, you may choose to obtain even more specialized training in a post-graduate residency program. Some of the specialty areas currently offering this training include emergency medicine, surgery, orthopedics, neonatology, and occupational medicine.

After graduating from a PA program, a PA must pass a national certification examination developed by the National Board of Medical Examiners and administered by the National Commission on Certification of Physician Assistants (NCCPA). A lifetime of learning continues as every PA must take continuing medical education classes throughout her or his career and pass a national recertification examination every six years. This helps to insure that each PA will maintain a core competency of medical and surgical knowledge.

What/where are the jobs?

PAs work in many different types of health care settings. Some work in hospitals, clinics, doctors' offices, schools, and private companies. PAs also work for the U.S. government in the military, Public Health Service, Veterans Administration, Bureau of Prisons, and in the White House. PAs serve communities of all sizes, from remote and rural towns to major cities. Most PAs work in primary care medicine—general or family medicine, internal medicine, obstetrics and gynecology (women' s health), pediatrics (child health), and mental health. But many also work in specialty areas such as orthopedics, surgery, neonatology (newborn care), and occupational (work-related) medicine. PAs can also work in educational settings like colleges or universities where they may offer medical care and/or teach other health care students, in health care administration, and in medical research settings.

The profession has grown so that now there are approximately 30,000 practicing PAs in the U.S. The demand for PA services is rapidly increasing as a result of increased recognition of the quality of care that PAs provide and the cost-effectiveness of those services. The Department of Labor projects that the total employment in the U.S. will grow by 14 percent through the year 2005. During that same period the number of PA jobs is expected to grow by 23 percent.

M'Lou B. Stevens, PA-C
National Institutes of Health
Washington, D.C.

For more information

For more information on physician assistant programs, the PA profession, employment opportunities and salaries, and obtaining credentials, please contact the following:

American Academy of Physician Assistants
950 North Washington Street
Alexandria, Virginia 22314-1552
703-836-2272
Fax: 703-684-1924
http://www.aapa.org

National Commission on Certification of Physician Assistants, Inc.
6849-B2 Peachtree Dunwoody Road
Atlanta, Georgia 30328
770-399-9971
Fax: 770-399-2766

Association of PA Programs
950 North Washington Street
Alexandria, Virginia 22314-1552
703-548-5538

For careers in anatomy:
http://www.anatomy.org/anatomy/

Psychology

What is a Psychologist?

A psychologist studies behavior and learning using observation, experimentation, and survey techniques. Some psychologists teach, some conduct research, and some apply their knowledge to problems of human behavior. Any combination of these is also possible. Most people think of psychologists as clinicians who test, diagnose, and treat emotional and behavioral problems. Clinical psychology is one of the major areas of psychology, but it is far from the only one. Developmental psychologists study normal patterns of development in children, adolescents, adults, the aged, or other animal species. Experimental psychologists increase our understanding of basic processes such as learning, motivation, emotion, and perception. Industrial and organizational psychologists aid in the selection and development of human resources in business or government. School psychologists treat social and learning problems of school children. Engineering psychologists design products, machinery, and work or living areas with the "human factor" in mind. Forensic psychologists work for the criminal and civil justice systems.

What makes a good psychologist?

An ability to work with people is important for most specialty areas. Curiosity, a strong sense of ethical responsibility, enjoyment of the problem-solving process, and good verbal skills are major characteristics of a good psychologist. Psychology requires creativity along with rigorous study and a desire to expand knowledge as well as apply it. A psychologist should have mathematical and scientific skills as well as an interest in people, behavior, and ideas.

What is life as a psychologist like?

A psychologist's work is challenging and interesting. The hours of work and intellectual energy needed can be great. Extensive work with disturbed people can make heavy emotional demands. It can be frustrating to have a client relapse or to have a carefully designed and executed study fail to support your ideas about behavior. Yet the gratification of advancing knowledge about behavior or helping others help themselves is not only satisfying but even exhilarating.

How do I become a psychologist?

A psychologist has different training than either a psychiatrist or a counselor. Psychiatry requires a medical degree with a specialization in psychiatry. Counselors concentrate on developing counseling and therapeutic skills in their advanced training. In contrast, a clinical psychologist must obtain a Ph.D. or Psy.D. in order to develop research skills as well as counseling and therapeutic skills. Clinical, consulting, and forensic psychology often require several years of supervised experience beyond the Ph.D. Many states, including New Mexico, require both a Ph.D. and supervised work experience before you can be certified to practice independently as a psychologist.

Almost all jobs require at least a master's, and a large majority require a Ph.D. degree. College teaching requires a Ph.D., as does most research. Junior college teachers should have at least a master's; more often than not, a Ph.D. degree is required. With a bachelor's or master's degree, you can teach in high school or work in government or business. For example, a bachelor's degree could lead to a job as an advertising consultant. Few high school teachers concentrate solely on psychology; instead, most obtain certification in the social sciences.

In high school you should take college-preparatory courses in math and the social and natural sciences to develop your research and analytic skills. A solid background in algebra is needed to understand how tests are developed and how scores should be interpreted. Trigonometry and calculus are important to understand the multivariate statistics increasingly in use by social scientists. A course in computer programming is also helpful. Take a broad sampling of psychology courses in college, even if you have already chosen your specialty. Some of the greatest advances in each area of psychology have been made by combining concepts from other areas, and you will be better able to discuss your work with people from varying backgrounds. Take laboratory courses to learn methods of inquiry and problem solving, and develop your math and science skills with courses in statistics, computer programming, and research methods. Do not neglect the humanities. Some of the most insightful ideas about people, behavior, and the mind come from philosophy, literature, and the arts.

In graduate school, traineeships can provide valuable and often necessary experience in most areas of psychology. Internships are a major component of all teaching and clinical practice programs, and a few corporations offer internships in engineering and industrial psychology.

What/where are the jobs?

Psychologists are employed by universities, large industries, government, medical and health facilities, and consulting firms. As in other fields, opportunities for employment in four-year colleges and universities are shrinking. Many clinicians choose to work outside academia in private practice, health organizations, school systems, or large businesses. Managed behavioral health care is slowly but steadily changing opportunities for clinicians to work, increasing opportunities for Master's level clinicians and decreasing them at the doctoral level.

For more information:

Call the American Psychological Association at 1-800-374-2721. They have a variety of publications including a free brochure entitled *Psychology: Scientific Problem Solvers—Careers for the 21st Century*. They also have a book for sale entitles *Career Paths in Psychology: Where Your Degree Can take You,* (1997).

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For additional information, see Careers for Psychologists (Washington, DC: American Psychological Association, 1979 ed.)